MARINE PROTECTED AREAS

Can the Antarctic Treaty Members reach the World Summit on Sustainable Development goal of a network of protected areas in the High Seas by 2012?

GCAS Syndicate Report

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1 Introduction

In recent years the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction has received increasing attention, there is growing agreement that Marine Protected Areas (MPAs) should be considered as an integrated and flexible management tool for the ocean. MPAs, in particular areas closed to certain fishing activities are proposed as a useful protective measure within the framework of precautionary and ecosystem based approaches, to reduce the impact of fishing on vulnerable marine habitats and species. The impacts are particularly acute in fisheries of deepwater demersal species, because of the use of non selective gears that potentially impact fragile habitats, in particular seamounts and other deepwater features. The need for adequate international and regional frameworks for implementing spatial based fisheries management measures in the high seas and methods to prevent illegal activities are widely noted in international discussions. These concerns are of particular importance to the implementation of high seas MPAs. At the 2002 World Summit on Sustainable Development, governments agreed on the objective to implement representative networks of MPAs by 2012, with the aim of conserving marine biodiversity and allowing sustainable use of marine resources (IUCN 2006).

This paper seeks to address the question of whether this goal of achieving a network of MPAs can be met by 2012. How can this be achieved and what resources are necessary to implement and maintain the MPAs or, if this is not achievable not why not?

Firstly, the current legal framework surrounding the development and acceptance of MPAs in the Southern Ocean will be identified and described. The Balleny Islands proposal will be discussed to illustrate how the fragmented legal process has resulted in the proposal being unsuccessful in its bid so far. The paper will

then describe a proposal for a management plan that we have developed for the protection of seamounts in the Southern Ocean that could be implemented in order to support the Antarctic Treaty System (ATS) goal.

2 Background

Antarctica and its surrounding oceans are a unique and powerful symbol of the natural world. Over the last 40 years or so, human affairs in the region have been managed cooperatively through the Antarctic Treaty System. Until the early 1980s the remoteness and hostility of the environment, in conjunction with the collective international focus on scientific research addressing major planetary concerns was sufficient to safeguard the region. The anthropogenic effects are evident in Antarctica. These include climate change, stratospheric ozone depletion and trans-boundary pollution from global activities are evident in Antarctica. However, increasing technical capabilities and expanding economic systems, particularly since the end of the Cold War, Antarctica has come under increasing pressure from commercial activities. The leading edge of this commercialism is comprised of the fishing interests presently plundering the Antarctic marine environment. (ASOC 2007) Global fisheries resources are in crisis, many stocks have collapsed as a result of over fishing, the collective environmental impacts of overcapacity, marine pollution, new fishing technology with harmful catching methods and Illegal, Unreported or Unregulated (IUU) fishing now threatens marine ecosystems across the world's oceans. Yet as global fish stocks have declined, consumer demand for fish products has increased. This increasing pressure to exploit fisheries resources could have devastating effects on the Southern Hemisphere fisheries population. (ASOC 2007).

3 The Legal Framework

3.1 Marine Protected Areas Definition

Marine Protected Areas, or MPAs would appear to be a very organised and developed coinage. However, they are not a term of art with specific legal bounds or definitions. An MPA is merely any area that an attempt is made to preserve for any reason. They may include protection for science, logistics, conservation, historic purposes. In this report we are addressing an MPA under the Madrid Protocol Annex V and within the mandate of the Convention of the Conservation on the Protection of Antarctic Marine Living Resources (CCAMLR).

3.2 Global Significance of Antarctic MPAs

The isolated, extreme environment of the far southern seas has allowed the area to be a model that over exploited areas can follow. Elsewhere it is too late and there are many strong interest groups preventing the funding, research and goodwill required to pioneer protection regimes on international waters. Grant asserts that there is 'continuing potential for the Antarctic Treaty System to demonstrate leadership in the development of a wider strategy for high seas MPAs' (2005: 42).

3.3 Preliminary Difficulties

Antarctic Treaty law contains ample enabling provisions to build MPAs. If these frameworks can be applied, the rest of the world may be able to benefit from lessons learnt in the Antarctic (Grant 2005). Their practical application is still a long way from fruition, as it requires committed cooperation between the different Antarctic Treaty area bodies and careful, comprehensive planning. The Antarctic Treaty System consists of the Antarctic Treaty, the Convention on the Conservation of Antarctic Seals (CCAS), (CCAMLR) and the Protocol on

Environmental Protection to the Antarctic Treaty 1991 (the Madrid Protocol). CCAMLR and the Madrid Protocol have differing boundaries which creates problems with harmonising their roles.

The vast majority of the Treaty areas are subject to high seas freedoms such as freedom of fishing and navigation. Most States do not acknowledge territorial claims in the Antarctic, and are not bound by the Antarctic Treaty. However, Article 13 of the Madrid Protocol allows members to notify non-member states if their nationals are in breach of the Antarctic Treaty. Time is another daunting barrier. The Antarctic Treaty and CCAMLR both require consensus to make decisions. Thus contentious issues around fisheries and conservation are continually impeded by interested states and progress is slow. Despite these obstacles, the Antarctic framework has higher and more robust protections than almost anywhere else in the world (Grant 2005).

3.4 Madrid Protocol

The Antarctic Treaty was drafted in 1959. At this time, the focus was not on biodiversity or ecological conservation, and centred around the importance of Antarctica remaining a continent for peace and science (Article I). In 1991, The Madrid Protocol was introduced to meet growing concerns over the global depletion of natural resources. The Protocol is a basic framework for environmental protection and conservation south of 60°S. Annex V of the Protocol creates Antarctic Specially Protected Areas (ASMAs) and Antarctic Specially Managed Areas (ASPAs).

3.4.1 Antarctic Specially Protected Areas

ASPAs are equivalent to the World Conservation Union's (IUCN) Strict Nature Reserve category of protection, and require a permit for entry and other activities. The strict restrictions in these areas serve a number of protection purposes. There are currently six marine ASPAs. They cover 1,800km^2 which is a mere 0.012 percent of the marine area south of 60°S. These ASPAs were not created within a set system or for a uniform purpose, indeed none of these ASPAs are located where fishing takes place, or are representative of major marine ecosystems. (Grant 2005).

3.4.2 Antarctic Specially Management Areas

ASMAs are equivalent to ICUN Category IV, and are designed to help manage and coordinate human activities. Higher management standards are expected to improve environmental protection (Grant 2005). They have a non-mandatory code of conduct for multiple uses such as tourism, scientific research, shipping and research station logistics. They require a lower level of protection than ASMAs, and no permits are required. There are currently three of these.

3.4.3 The Downfall of MPA Development under the Madrid Protocol

The scarcity of MPAs in the Antarctic is partly attributable to the fact that little attention has been given to *marine* protection, as an environment distinct from *terrestrial* areas (Njastad 1998, Valencis 1999). Another major barrier is that the Madrid Protocol cannot grant an ASMA over living resources without approval from CCAMLR. On the face of it this should not be a problem. In reality however, there is no cooperation and harmonising mechanisms in place between the Protocol and CCAMLR, this authority is thus neither sought nor granted.

3.5 Convention of the Conservation of Antarctic Marine Living Resources

Adopted in 1982, CCAMLR was a direct response to the realisation that krill was pivotal in the global food web and that the effective management of krill and other Antarctic marine living resources was needed (Grant 2005).
CCAMLR is unique and radical globally. Its mandate is relatively biocentric and it is the leader of the ecosystem approach to fisheries management (Burgess et al. 2002). Article II outlines CCAMLR's objectives as 'the conservation of marine living resources'. It then includes the anthropocentric qualifier that this involves 'rational use', thus making provision for human exploitation. Its northern boundary is the Antarctic Convergence (CCAMLR, Article I).

CCAMLR outlines three principles of conservation in Article II. Exploitation must be in accordance with them. The first is to prevent resource levels dropping below stable levels of recruitment, the second is to maintain relationships between those harvested resources and their dependent and related populations, and the third is to prevent or minimise changes in the marine ecosystem which are not potentially reversible over two or three decades.

These conservation measures defined by CCAMLR meet a level of management that theoretically classes the entire CCAMLR area as an ICUN Category IV protected area (Habitat/Species Management). This is distinct from a MPA. CCAMLR goes further than the ICUN Category IV protected areas in some localities. One of these higher protection tools are 'closed areas'. Where these areas are not quota-dependent or seasonal, they may meet the ICUN definition of an MPA. However, despite the technical ability to allow MPA development, none have been designated, there are no areas where fishing activity of every kind has been permanently prohibited.

However, since 2000, New Zealand has stated its intention to propose a high seas MPA that includes the Balleny Islands and the waters that surround them. The archipelago straddles the Antarctic Circle and contains several habitats that are representative of the Antarctic region, from the terrestrial and coastal zone of the islands to the marginal ice zone and seamounts. The goal of the proposal was to create an integrated marine diversity reserve incorporating these aspects. The key objectives of the proposal to expand the protection to the entire archipelago includes, avoidance of degradation of the values of the area by preventing unnecessary human disturbance, to preserve the natural ecosystem as a reference area, to contribute to the protection of biodiversity in the Ross Sea region, to allow for appropriate scientific research, to minimize the risk of unwanted species introductions. As previously mentioned, conservation and scientific study are identified in the Treaty and CCAMLR, New Zealand's quest to establish the Balleny Islands the Antarctic's first MPA involved several challenges. The proposal was the first MPA with a substantial marine component and as such it was a test case for the process, identification and designation of MPAs in Antarctica.

In addition to the process issues there were discussions as to whether a MPA was at odds within the CCAMLR concept of rational use. Opponents of the proposal argued that the marine area around the Balleny Islands was an important area in respect to potential future fisheries and that the designation of a MPA would limit future rational use of the marine living resources. This has led to confusion as it was perceived that the main underlying reason for the proposal was to protect Patagonian and Antarctic toothfish from the potential effects of over fishing (Harris 2001). This has led to confusion over whether the proposal was in fact intended as a fisheries management tool which should be dealt with under the auspices if CCAMLR rather than the Treaty (Burgess et al 2002). However, since 2005 the discussions on the development of MPAs within CCAMLR have recently advanced acceptance of conservation objectives into the fisheries management regime. This indicates a willingness by CCAMLR

members to take action towards developing and testing new approaches for establishing MPAs that further the objectives of CCAMLR (Burgess et al 2002).

The Balleny Island case study also illustrates the problem posed by Antarctic marine conservation and fishing in seeking to operate in a part of the world where the basic social, political and legal structures that underpin and regulate such activities are largely absent. The ATS exists as an attempt to manage an integrated ecological entity through overlapping international agreements, the limited regulatory environment has predisposed the ATS to vulnerability and inadequacy when it comes to sophisticated commercial entities, particularly illegal ones involved in private fishing. During the past decade the incidence of illegal (IUU) fishing has grown at an alarming rate within the Convention area. Substantial catches of toothfish have been taken by long line fishing and in more recent years by gill net fishing. CCAMLR estimates of IUU fishing are well in excess of the allowable catches allowed by CCAMLR. IUU fishing for toothfish in the Southern Ocean has also resulted in the slaughter of thousands of seabirds on the hooks of the longline fishing vessels. The Catch Documentation Scheme introduced by CCAMLR in 2000 to monitor the landings as well as the trade in toothfish constituted an unprecedented initiative aimed at combating and assessing IUU fishing for those species.

3.5.1 Discussions on the Future

MPAs are drastically under-utilised, but their development is in the park of international negotiation and though it promises to be a lengthy process, the ball is rolling. Grant (2005) speaks positively about the progression of MPA creation through a number of important discussions within CCAMLR. Mostly these MPA discussions have been about aligning the CCAMLR system with the ATS. The future prioritie will be how CCAMLR itself should actively develop MPAs. It was emphasised that from the outset a strategic, comprehensive approach to MPA

development would be needed, as was cohesion with the ATS. CCAMLR encompasses a wider area than the Protocol, beyond the 60°S to the ecological boundary of the Polar Front. This, and lack of communication and cooperation has stilted the development of MPAs in the Antarctic.

At a CCAMLR workshop in 2005, members looked into the current principles and practices for establishing MPAs, how MPAs could further the objectives of CCAMLR and what scientific information may be needed. While only a small step, these discussions are an exciting milestone in creating High Seas MPAs worldwide. It is interesting to note that most CCAMLR members are signatories to the Convention to Biological Diversity and the World Summit on Sustainable Development, the World Parks Congress, and other, and thus are already under an obligation to establish networks of MPAs.

3.5.2 Global Application

CCAMLR's procedures are globally invaluable, as other RFMOs may be able to follow CCAMLR's lead in conservation and fisheries management (Grant 2005).
The focus on a sustainable, ecosystem approach to fisheries on the international stage has immediately placed a spotlight on the creation of MPAs. Provisions for their creation have been incorporated into several international treaties, for example the United Nations Fish Stocks Agreement and the Food and Agriculture Code of Conduct for Responsible Fisheries. Global commitments have been made to the formation of MPAs as they are identified as one of the crucial tools in achieving the ecosystem approach to fisheries management. Without careful planning and design realistic goals will not be met (Martin et el 2006).

3.6 Funding and Existing Frameworks

Once in place, funding is the barrier which curtails MPA performance. MPA plans are often too ambitious. Enforcement and monitoring require significant, ongoing funding. It is usually local or national government that provides this support. Martin (2000) suggests that justifying the costs to these bodies is better achieved by emphasising the management of fisheries benefiting peoples' livelihoods than a focus on ecological protection alone.

MPAs must be designed to fit within existing legal frameworks, so that it is easy for governments to incorporate and support them. If there are no fisheries frameworks in place, the MPA still needs to fit neatly within the legal system (Martin et al 2006). More effort and research needs to be put into building bridges between conservation legislation and fisheries legislation. In most jurisdictions they fall into different departments and there is a lack of cooperation and understanding between the two.

4 Seamounts: An overview of their ecological significance in the Southern Ocean and a proposal for their designation as Marine Protected Areas

The following section outlines the ecological significance of seamounts and highlights the reason why it is essential to protect them.

Seamounts represent a unique habitat in the deep-sea environment. They are individual, prominent, elevated features of the world's seafloor topography. Seamounts are typically cone shaped extinct volcanoes that rise abruptly from the deep ocean floor but do not reach the surface (Clark et al 2004). Seamounts are defined by oceanographers as independent features that rise at least 1000m above the seafloor (Nynakken and Bertness 2005). Therefore they are considered within the deep-sea. There are an estimated 50,000 seamounts in the

world's ocean and potentially up to 100,000 seamounts exceeding one kilometre, and many more of smaller elevation (Vierros and Chenug 2007). Seamounts have been sampled since the ninteenth century, but only in the last few decades have deep water sampling gear and underwater vehicles allowed sampling of isolated biota, mapping and imaging of the seabed.

6.1 Global Distribution of Seamounts

Seamounts are generally formed over hotspots, which are points of frequent volcanic activity in the earth's crust, persisting over millions of years. Because of their volcanic activity seamounts are found near mid-ocean spreading ridges, over upwelling plumes and in island-arc convergence settings. Because seamounts do not break the sea surface, knowledge of their distribution comes primarily from remote sensing. Traditionally seamounts have been mapped by acoustic echo sounders on oceangoing research vessels (Vierros and Chenug 2007). Today, alternative methods include the use of satellite altimetry or estimated primary productivity to infer seamount locations. Relatively few seamounts have been studied, only 350 have been sampled and only 100 in detail (Clark et al 2004). Figure 1 illustrates a global map of seamount distribtuion. It highlights that seamounts are yet to be researched in the Southern Ocean.

A Global Census of Marine Life on Seamounts (CenSeam) has been established by the national Institute of Water and Atmospheric Science (NIWA) to combat the lack of knowledge on seamounts. It's objective is to determine the role of seamounts in the biogeography, biodiversity, productivity, and evolution of marine organisms, and to evaluate the effects of human exploitation on seamounts by 2010 (Clark et al 2001).

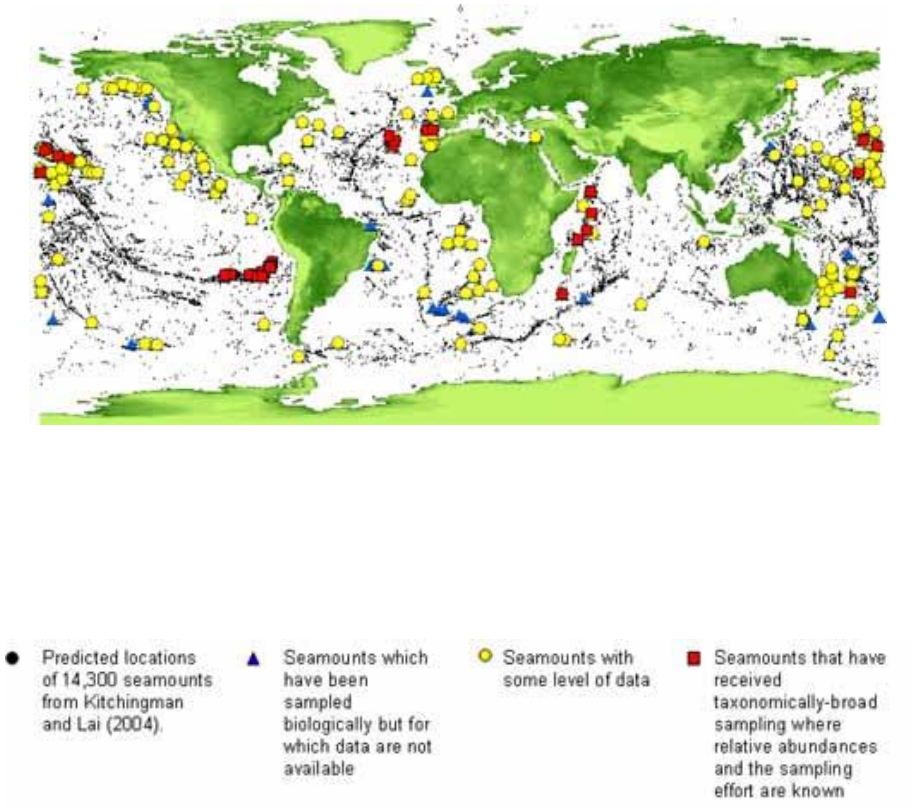

Figure 1: Map of seamounts either being studies or with well-advanced research proposals. Source: Vierros and Cheung (2007)

There are many seamount formations in the Southern Ocean, including several concentrated on the Kergulen Plateau. Others include the De Gerlache, Balleny, Islas Orcadas, Scotia Arc, Ob, Lena and Hubert Miller Seamounts.

6.2 The General Biodiversity of Seamounts

In the past, it has been assumed that at depths where light never penetrated and plants could not grow, life would be restricted to a few particular species. However, structures, such as seamounts, on the deep-ocean floor play host to an

amazing array of species comparable in their abundance and diversity to those found in tropical rainforests and shallow coral reefs. Because of the extreme and isolated nature of seamounts, many life forms are believed to be unique to a particular mount. Seamounts are known to support high biodiversity and special biological communities with high levels of endemic species. However, although recognised as ecologically and evolutionary important habitats, relatively few seamounts have been sampled, and their ecosystems are poorly understood (Clark 2004).

The species compositions of seamounts differ from those of the surrounding deep seafloor and continental margins of similar depth. Figure 2 shows the general range of species that inhabitat seamounts. The winnowing of currents over seamount topography means that many seamounts have rocky substrates where emergent epifauna such as crinoids, seawhips and sponges live. Sea spiders, whelks, octopus and crustaceans also live around seamounts. The benthic fauna of the hard substrates of seamounts is dominated by suspension feeders, for example various species of gorgonians, antipatharians and sponges. Some sponge beds are thousands of years old and can support a rich network of species (Clark 2004). Soft sediments also accumulate on seamounts and the dominant organisms occurring in the sediments are annelids and bivalves (ASOC, 2007). In addition to acting as feeding grounds for fishes and marine mammals, seamounts can also attract seabirds, which prey on organisms around seamounts.

High densitites of fish are associated around seamounts. Aggregations of fish around seamounts are on average more vulnerable to fishing than other fish (Vierros and Chenug 2007). Seamount fish are large in size, slow growing and late maturing. These life history characteristics render them less able to withstand fishing mortality. Additionally, the localised distribution of many benthic seamount species greatly increases the threat of extinction.

There are a number of reasons for the high density of marine life on seamounts. The local hydrographical conditions produced by seamounts enhances primary productivity in the epipelagic waters above the submerged peak, which in turn leads to increased densities of zooplankton. This explains the high concentrations of fishes on and around seamounts (Nybakken and Bertness 2005). Another suggestion for the high density of species is that fish are supported by feeding on zooplankton which are trapped by the seamount as they descend. Upwelling is another reason for the high biomass on seamounts. Current-topography interactions on seamounts include semi-stationary eddies, internal wave reflection, tidally induced currents and eddies, trapped waves, and eddies shed downstream. Due to these strong localized currents and upwelling, the plankton biomass is often high over seamounts and this, combined with the constant influx of prey organisms, means that they can attract large numbers of fish.

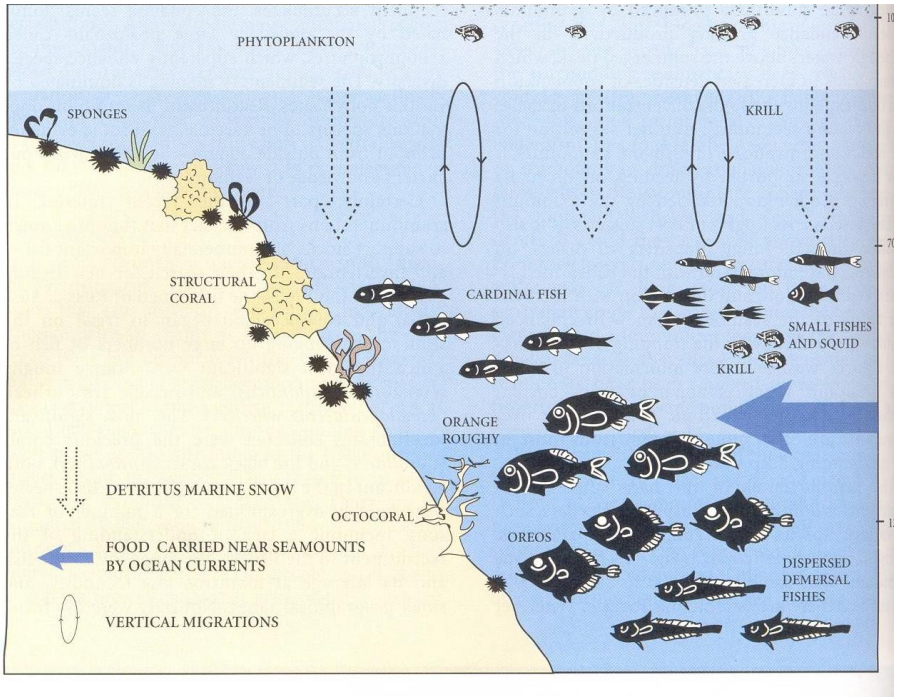

Figure 2: Diagrammatic representation of the organism associate with seamounts. Source: Nybakken and Bertness (2005)

Seamounts may play an important role in understanding patterns of marine biogeography, as hotspots for the evolution of new species, refuges for ancient species and stepping-stones for species to spread across ocean basins. The degree to which seamounts are genetically isolated is not well understood (Vierros and Chenug 2007). Some studies suggest there is limited gene flow between seamounts while species with good dispersal abilities are spread throughout a wider area (Vierros and Chenug 2007). Patterns of colonisation appear to be related to dominant current flows in the area.

6.2.1 Patagonian toothfish

Pataginoan Toothfish, *Dissostichus eleginoides,* represent a major benthic finfish resource in the Southern Ocean. It is known that they inhabitat seamounts. The species grows to over two metres and 100kg (Smith and McVeagh, 2000). These fish have a circumpolar distribution and are widely distributed around Sub-Antarctic Islands and seamounts between 50-60°S (figure 3). Areas of high Patagonian Toothfish density lie are around the South Orkney Islands, the Antarctic Peninsula and southern Kergulean Plateau (Smith and McVeagh 2000). Evidence from growth rates and spawning times indicates regional differences in these fish. Genetics work, by Smith (n.d.), identified that individual fish stocks inhabit particular a seamount or Sub-Antarctic Island. Therefore, the fish stocks are isolated and do not migrate far. Hence, there is huge potential for these fish to be depleted quickly.

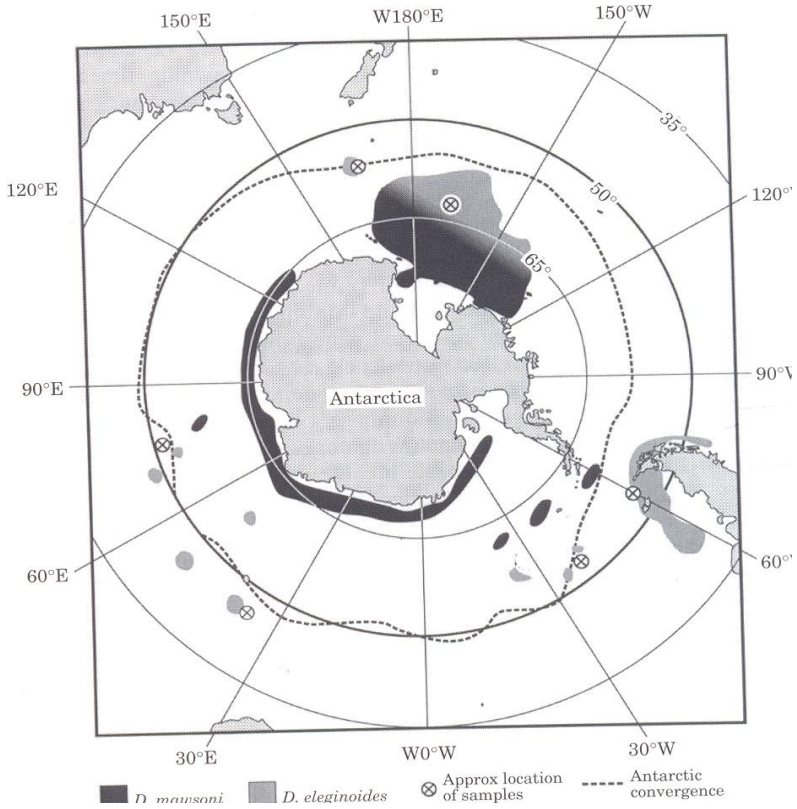

Figure 3: Location of toothfish *Dissostichus eleginiodes* sample collected in the Southern Ocean. Source: Smith and McVeagh (2000)

6.2.2 Case study on Notothenii rossii

Commercial exploitation of N. rossii around the South Georgia started in the early 1970s but was remunerative only in the first season. The following season the catch dropped to one fifth of the previous season and subsequently declined significantly (figure 4). The dramatic decline of this fishery, where the fish stock was practically wiped out in three years indicates that Antarctic fisheries are not sustainable. (Kock 1992). There is potential that the same could happen to the Patagonian Toothfish.

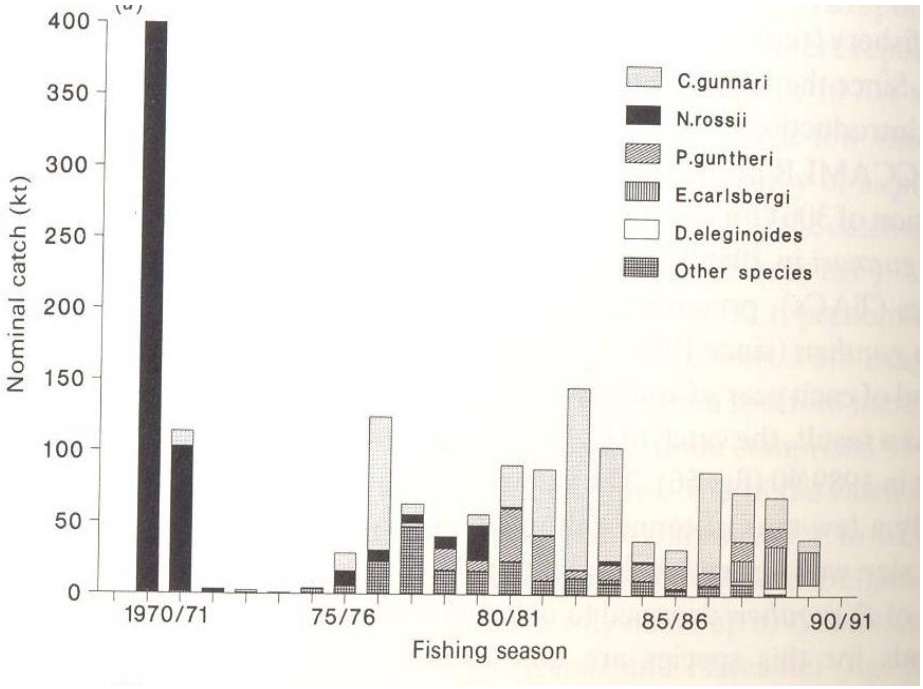

Figure 4: Nominal catch by species around South Georgia from 1969 to 1990. Source: Kock (1992)

Prince Edward Island waters, under the jurisdiction of South Africa, is subject to very large illegal catches of Patagonian Toothfish. Application of a simple age-structure production model provides a robust indication that the spawning biomass has been depleted to, at most, a low percentage of its pre-exploitation level (Brandao et al 2002). Watson and Morato (2004) showed that seamount fisheries collapsed faster and recovered more slowly than non-seamount fisheries. More than 76 species have been commercially harvested from

seamounts including: Orange Roughy, Pelagic Armourhead, Oreos, Rockfish and Alfonsion (Clark 2004). The sensitivity of this fishery highlights the need for protection of Patagonian toothfish.

In the past decade catches have increased steadily and unofficial estimates suggest a catch in excess of 80,000 tonnes per annum through illegal fishing (Smith and McVeagh 2000). These fish are very popular in the American and Japanese markets for there white flaky flesh, texture and taste. These highly sort after fish make commercial fishing very attractive. Because of their slow maturation rates, commercial fishing is a huge threat to the sustainably of these stocks.

6.2.3 The Impacts of Bottom Trawling

Seamount trawl fisheries have impacts on the fragile benthic communities on seamounts Current deep-sea bottom trawl fishing technology is particularly destructive of deep-sea habitats and species. This fishing technique uses heavy duty gear specifically designed to drag along the ocean floor. Often rollers, rubber wheels, metal plates and chains are attached to the trawl to smash and crush structures that might otherwise catch or rip the net, and inevitably smashing any of the delicate and living structures that get in the way. These structures can be seamounts. High densties of many species congregates around seamounts. Thus they are a popular target for commercial fisheries leading to serial depletion of these fish populations, and essentially an unsustainable fishery.

Studies done by the Deep Sea Conservation Coalition (DSCC) suggest that damage to deepwater communities is occurring. Evidence indicates that deep-water life forms are very slow to recover from such damage, and can take decades to hundred of years, if they recover at all (ASOC 2007). Bottom trawling can inevitably drive a new wave of extinctions. It destroys the habitats of many

species, including many undiscovered species, by and altering the topography meaning many species do not survive. Bottom trawling is currently unregulated in the high seas. Faced with declining fish stocks in near coastal waters, fishermen are venturing farther out into previously unexploited areas, like the Southern Ocean. Advancing technology allows them to easily locate and catch these fish in formerly inaccessible areas. Trends indicate that the capacity to bottom trawl in the high seas is expanding (CCAMLR Report 2004).

There are estimated to be 100 to 200 fishing vessels currently operating full time on the high seas. Only eleven nations take over 95 per cent of high seas catch (ASOC 2007). The catch is primarily sold to the European Union, United States and Japanese markets. The destruction caused by bottom trawling is disproportionate to its economic importance and it is less than 0.5 per cent of the worldwide fish catch (ASOC, 2007). Environmental injustice is clear. Devastation is expected to continue at an exacerbated rate as national Exclusive Economic Zones (EEZs) are fished out, and more nations will move to the high seas and their seamounts.

6.3 The Legal Considerations for Fisheries Effect on Seamounts

6.3.1 The United Nations and Concerns for Seamounts Worldwide

The 2004 General Assembly's Oceans resolution called upon states to take action urgently to protect seamounts on a case-by-case basis, using scientific knowledge and the precautionary approach. Consensus on a moratorium on high seas bottom trawling was prevented by some of the states engaging in the practice. Thus, the diplomatic pressure afforded by the UN General Assembly resolution is the only incentive states have to stop bottom trawling.

The DSCC is a group of international organisations working towards protection of seamounts, cold-water corals and vulnerable deep sea ecosystems. The

Antarctic and Southern Oceans Coalition (ASOC) joined the DSCC and its membership illustrates the growing industry interests and corresponding environmental concerns for deep sea areas beyond national boundaries. The DSCC has been pressuring the United Nations to impose a moratorium on unregulated high seas bottom fishing unless or until effective measures to protect vulnerable marine ecosystems are adopted and implemented. The United Nations response to this fell short of a moratorium but acknowledged the importance of the issue. This response by the UN General Assembly in 2006 was to make a resolution on Sustainable Fisheries. This new resolution, Resolution 61, imposes new multilateral obligations to protect sensitive marine ecosystems from bottom fishing in areas beyond national jurisdiction. It covers approximately 90 percent of High Seas bottom fishing, and the resolution covers two thirds of the world's high seas. This resolution reaffirms the 2004 resolution and sets a two year time limit on States and Regional Fisheries Management Organisations (RFMOs). The States and RFMOs are to assess the impacts of bottom fishing in the high seas, and prohibit it where they cannot be managed to prevent "significant adverse effects" to vulnerable marine ecosystems (UNGA Resolution 59/25). The UN General Assembly also call upon states to apply the precautionary approach, by preventing high seas bottom fishing where vulnerable marine ecosystems are known or *likely to occur* unless they can manage the damage.

In Duncan and Curries' (2004) list the vast areas still not covered by RFMOs and thus theoretically at higher risk of over-exploitation. 'To believe that RFMOs for these areas will be created and then will formulate and implement effective measures, all in a realistic timeframe, when bottom trawling is estimated to devastate an area twice the size of the United States each year, defies belief' (Duncan and Currie 2004).

6.3.2 The current climate

There are still serious gaps in the scientific knowledge on the locations and ecology of the vulnerable marine ecosystems (VMEs). However, there are huge efforts being made to address this problem. In a report by the United Nations Environment Programme (UNEP), the International Oceanographic Commission (IOC), and the Census on Marine Life in November 2006, the discovery that stony coral *may* be present on seamounts across a vast area of the high seas means that States must prohibit all bottom fishing on the sea mount, in order to be in compliance with their UN obligations under the 2006 Resolution 61. This report however, only looked at one type of marine ecosystem, and areas other than seamounts and species other than stony corals are equally in need of protection.

Thus, the international community is paying attention, and applying diplomatic pressure to the relevant actors, but the clock is ticking on the natural environment as the bureaucratic wheels spin as slowly as ever.

The following proposal has been developed in order to support the ATS members in their bid to develop a network of MPAs by 2012

7 A proposed management strategy for seamounts in the Southern Ocean

It is evident from the information outlined above that there are many obstacles to overcome when attempting to designate a habitat as a Marine Protected Area (MPA). There is no doubt however, that CCAMLR (1982) and the Madrid Protocol (1991) have the power to designate and regulate such protected areas, if appropriate scientific research is carried out on the area in question. In order to create a viable proposal to protect Southern Ocean seamounts and because

none are protected to date, it is necessary to evaluate the success of seamount MPAs in other parts of the world.

7.1 Tasmanian Seamounts Marine Reserve

Created in 1999, the Tasmanian Seamounts Marine Reserve has experienced much success in maintaining a healthy fishery and preserving benthic biodiversity. It was designated a protected area after a three year research programme in the area which yielded results that suggested it should be protected (Schmidt and Christiansen 2004). It was identified as an area in need of protection before any detailed research was carried out and as a result, temporary boundaries were created until the appropriate research had been completed in order to take the best precautions. The significant size of the protected area (38,900ha) and the method of stratified zoning used to partition the water column allows for comprehensive protection. The zones are based on vertical depth, with the most highly protected zone at a 500m depth – 100m below the seabed aimed at protecting the benthos and utilised for scientific research and ecosystem monitoring. Fishing in this zone is prohibited, as is any activity that penetrates the water below 500m, unless a permit is issued. The second zone occurs in the surface layer (0 – 500m) and management of this area exists in order to hinder the alteration of natural oceanic processes. Fishing is permitted in this area unless it involves bottom trawling and also requires a permit. Any vessels in the vicinity of the Marine Reserve are required to have an onboard Vessel Monitoring System (VMS) in order to provide information on the ships activities and whereabouts.

The management plan for this area acknowledges the bioregional nature of the ecosystem and linkages to other areas, taking an ecosystem approach to conservation (Schmidt and Christiansen 2004). It outlines modes in which the health of the area can be assessed, including water quality and turbidity assessment coupled with data on vessel movement. A set of measures have been put in place to ensure that the state of the marine reserve and the

importance of its protection are communicated to a wide range of audiences including stakeholders and fisheries organisations, and the Coast watch and Defence Force also monitor activities in the area (Schmidt and Christiansen 2004).

7.2 New Zealand Seamount Protection

It was realised that New Zealand's seamounts needed to be protected after it was found that *Hoplostethus atlanticus* (commonly known as the Orange Roughy) had virtually been fished out of New Zealand's EEZ. In 1986, the Individual Transferable Quota system was introduced as a management tool whereby fisheries were permitted to take a limited quota of fish that was only a small percentage of the total estimated stock size. A Total Allowable Catch figure is released each year and is based on assessments on the current state of the fishery. Not only is there evidence for long-term damage to the *Hoplostethus atlanticus* fishery, but invertebrate by-catch is a huge problem during bottom trawling. In 1999, the New Zealand Seamount Strategy was drafted with the aim of protecting seamounts from damage due to bottom trawling. Extreme measures were taken to ensure recruitment of marine species where fishing was prohibited in any area within 50m of the seabed adjacent to a seamount (Smith n.d.). In 2000 a complete ban on trawling in the vicinity of 19 seamounts that was enacted (Smith n.d.). Ongoing research is being carried out to assess the success of the New Zealand Seamount Strategy and is based on a 'Fishing Importance Index' that encompasses factors such as the abundance of fish species, the time over which the fishery has taken place and Catch Per Unit Effort (CPU) (Clark and O'Driscoll 2003). Clark and O'Driscoll note that it is often difficult to distinguish between natural damage to the seafloor and damage done by trawling, which is a problem when attempting to establish the health of the seamount (2003).

The following outlines a proposal for the protection of seamounts in the Southern Ocean, using the guidelines under Annex V, Article 5, of the Madrid Protocol. In order for the ATS to meet the World Summit Goal it is important that the proposal is workable, appropriate in size and robust enough to protect the specified ecosystem values of seamounts. If these requirements are not met, it is likely that the proposal may meet the same fate as the Balleny Islands submission.

7.3 A Management Proposal for Designation of Southern Ocean Seamounts as Marine Protected Areas.

(a) Description of values for which special protection or management is required

Southern Ocean seamounts are among the most understudied marine features in the world, as discussed above. Virtually no data exists on the nature of benthic diversity adjacent to these seamounts. although it is acknowledged that these habitats may harbour unique organisms displaying high levels of endemism. Because the seamounts in the Southern Ocean have not been adequately studied, there is not enough data available to produce a thorough management proposal on any specific seamounts. This proposal will therefore be a superficial guide to management of such seamounts and may be of some use once further studies have been carried out.

As mentioned above, the Patagonian Toothfish, is highly valuable to fishing industries and is the target of many vessels undergoing IUU fishing. A tag and recapture study on the Patagonian Toothfish yielded that the fish rarely travels more than 15nm from its territory (Williams et al. 2002) (figure 5) while a more recent study suggests that they only occasionally move further than 60km (32nm) irrespective of their time at liberty (Marlow et al. 2003) (figure 6). Because it is an organism that does not move great distances, stocks of the Patagonian Toothfish can be fished out very quickly and therefore require stringent protection.

However, the nature of these isolated fish stocks make the fish easier to manage.

Therefore, it is proposed that it is ecologically viable to manage and protect the Ptagonin Toothfish residing near seamounts, as well as the array of invertebrates that experience high rates of mortality to due bottom trawling.

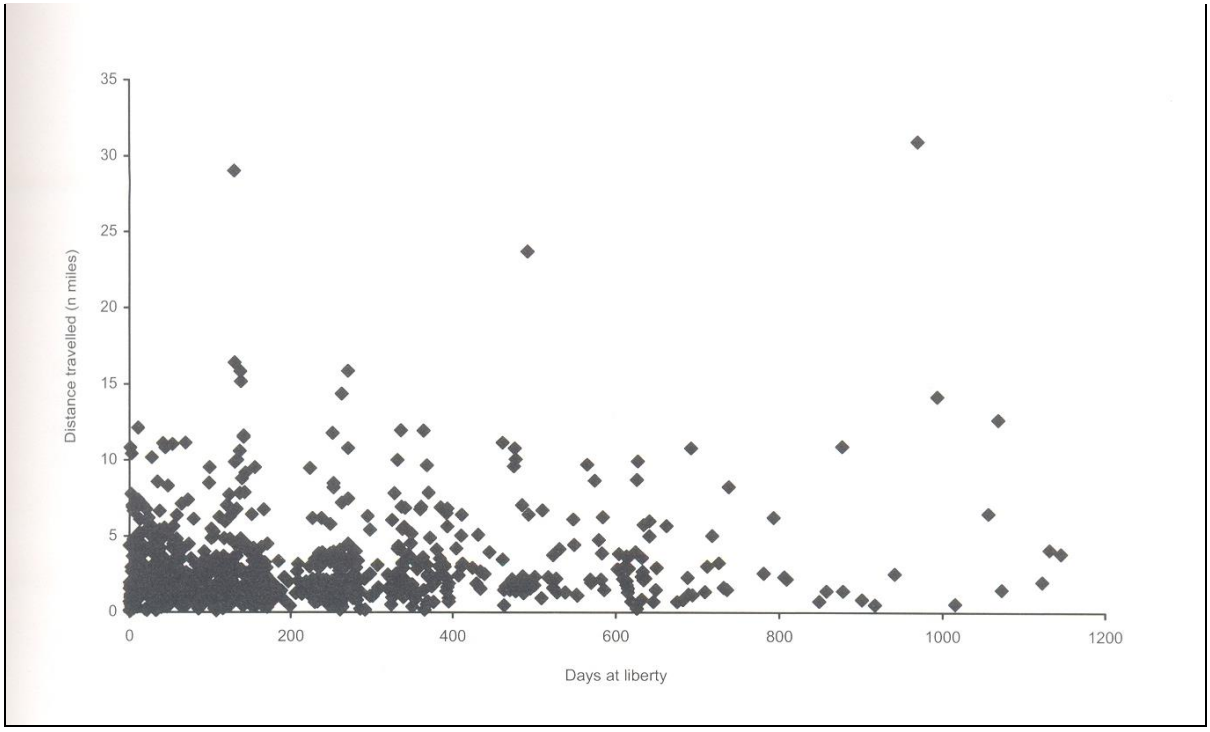

Figure 5. Distance travelled from Heard Island by individual *Dissostichus eleginoides* after being tagged and spending differing periods at liberty.
Source: Williams et al. (2002)

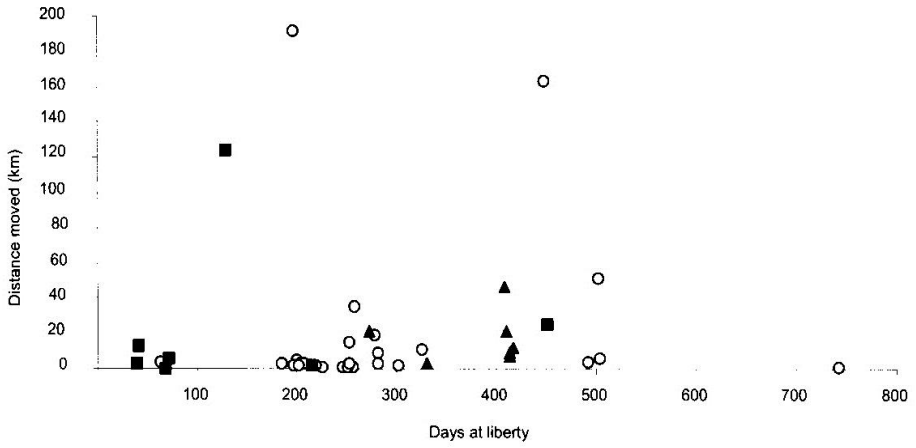

Figure 6. Distance travelled from South Georgia and Shag Rocks by individual *Dissostichus eleginoides* after being tagged and spending differing periods of time at liberty. Source: Marlow et al. (2003)

The values in need of protection are as follows:

(1) Environmental Values

Seamounts support a wide range of organisms, disproportionate to their habitat size. Fish stocks in the vicinity of seamounts need to be protected in order to maintain sustainable fisheries which may be accessed in the future.

(2) Scientific Values

Seamount ecosystems have the potential to harbour invertebrates displaying high levels of endemism, meaning that they may only be exclusively found in the Southern Ocean. In addition to this, Southern Ocean seamounts are among the most understudied in the world and the precautionary approach should be taken if exploitation of these unexplored habitats is occurring.

(3) Wilderness Values

The pristine nature of deep-sea ecosystems and their relative isolation from anthropogenic intervention is a primary reason for their protection. Bottom

trawling, carbon dioxide sequestration, mining activities and overfishing are direct threats to the wilderness and aesthetic values of seamounts.

(b) Statement of the aims and objectives of the Management Plan

The aim of the management plan is to ensure:

(1) Stable recruitment of populations of *Dissostichus eleginoides* adjacent to seamounts
(2) The preservation of invertebrate biodiversity on and adjacent to seamounts
(3) Protection of substrate on the seamount from damage due to trawling
(4) No alteration of natural processes occurring in the water column above and around the seamount

(c) Management activities that are to be undertaken to protect the values for which special protection or management is required

It is proposed that the following projects will offer valuable scientific information regarding the importance of seamounts in the Southern Ocean and results from these projects can therefore be used to increase the value of this proposal:

(1) Census of Antarctic Marine Life (CAML), an International Polar Year (IPY) project planned for February/March 2008 that aims to look at life in and around seamounts.
(2) Global Census of Marine Life on Seamounts (CenSeam), a project that aims to be completed by 2010 and identifies the Southern Ocean as a key study area.
(3) Exploration of Polar Seamounts, an IPY project aimed at carrying out a 'comprehensive assessment of the biodiversity and biology of seamounts in polar waters' (Rogers n.d.).

Subsequent to the release of the results from these projects, appropriate monitoring regimes can be put in place to ensure protection of individual species. Without this knowledge and research, it is simply not viable to create specific management plans. It is however important that the management plan follows the guidelines of plans such as the one designed by the World Conservation Union (IUCN) (figure 7).

Figure 7. Flow diagram illustrating the World Conservation Union (IUCN) management guidelines. Source: Schmidt and Christiansen (2004).

(d) A description of the area

On the basis that there is no sufficient data available for any specific seamounts in the Southern Ocean, this management plan is designed to be applied to any seamount that is found to harbour fish exploited by fisheries operating under CCAMLR such as *toothfish*, and a selection of molluscs, bivalves, echinoderms and any range of other invertebrates requiring protection.

The management strategy could be applied to a range of seamounts in the Southern Ocean

Once a seamount has been identified as needing protection, it is essential that the boundary of the seamount is delineated using remote sensing technology in order to ensure that the entire seamount is included in the MPA. The seamount will be located in the centre of the MPA as illustrated below (figure 8).

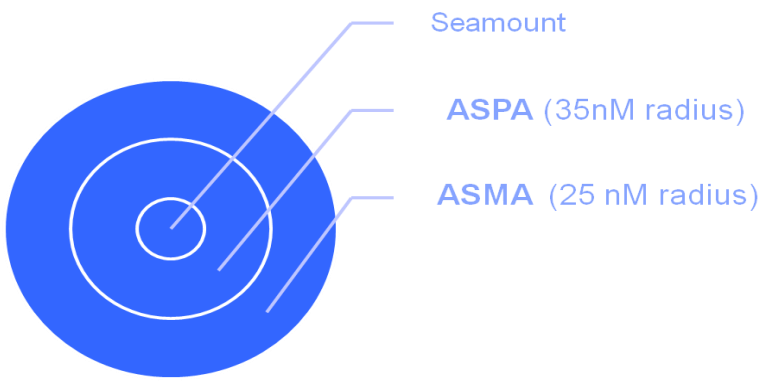

Figure 8. Structure of the proposed Marine Protected Area illustrating the central position of the seamount inside a 60 nmile area of protection.

The proposal seeks to replicate the success of the vertical and horizontal zoning of the water column used in the MPAs in Tasmania and New Zealand.

Horizontal Zoning of the Water Column

Extending from the outer boundary of the seamount is an ASPA that encircles the seamount and has a radius of 35 nmiles. This distance was selected based on the studies by Williams et al. (2002) and Marlow et al. (2003) and would encompass 99.1 percent of the recaptured fish in these studies, where only seven recaptured fish would have ventured outside this area. Because the

invertebrates residing near seamounts are relatively sessile, this area will be of an adequate size to ensure their protection.

Entry into the ASPA area requires a permit as specified in Annex V, Article 3, Section (4) of the Madrid Protocol (1991). The following activities are prohibited:

a) Fishing activities, including bottom trawling
b) Any activities involving carbon dioxide sequestration or mining
c) Any other activities not currently existing that may have the potential to cause irreversible harm to the ecosystem
d) The removal of any organisms from the area unless a permit is issued for example for scientific research

As a precautionary measure, it is proposed that an area of 25 nmiles extending from the outer edge of the ASPA should be designated as an ASMA. This will allow for any discrepancies in the designation of the ASPA and provide further protection at a lower level.

Entry into the ASMA does not require a permit as specified in Annex V, Article 4, Section (3) of the Madrid Protocol (1991).

Vertical Zoning of the Water Column

Vertical zoning is applied only to the ASMA area, as prohibitions in the ASPA apply to the entire water column and therefore zoning is unnecessary. The ASMA area will be divided into two zones:

(1) Highly Protected Zone (HPZ) – (within 100m of seafloor): The prohibitions that apply to the ASPA area also apply to this zone of the ASMA (figure 9).

(2) Low Protection Zone (remaining surface layer): Legal fisheries activities are permitted from October to April at the time when large spawning events are not taking place. This allows the fish to reproduce and will facilitate the growth of fish stocks. Vessels must follow guidelines as specified in CCAMLR and report on their total annual catch and their (CPUE) within the MPA (figure 9).

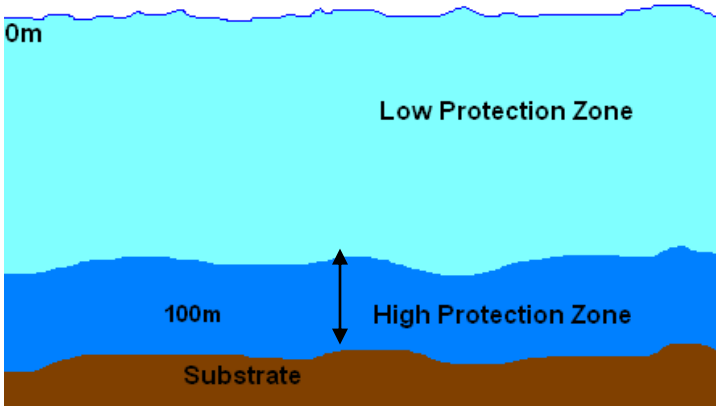

Figure 9. Proposed vertical zoning of the water column in the Antarctic Specially Managed Area, within the MPA.

Vessels that venture into the Marine Protected Area will be subject to the following regulations and sanctions:

(a) Flags of convenience are prohibited in the area. This will assist in deterring IUU fishing.

(b) Any vessel that flies a foreign flag in the MPA and any vessel that does not comply with the rules and regulations within the MPA, will be denied access to fish in their countries' EEZ and on the High Seas.

(c) Non compliance will result in the blacklisting of the vessel and the company or companies with which it is associated.

8 Conclusion

This report has suggested a proposal for a MPA for seamounts in the Southern Ocean in order to support the ATS members to attain the goal of a network of MPAs in the High Seas. However, research into this topic has identified a number of constraints and threats that will affect the successful implementation of the MPA if not firstly addressed.

Threats to Antarctica include the direct, indirect and cumulative impacts of such as fishing, tourism, bio-prospecting and mining as well as the destabilisation of the fragile politico-legal system managing human activity in the region. The threats to Antarctica come from entities in a small fraction of states in the global community, yet they affect 10 percent of the surface of the planet, and a larger percentage of the global commons. (ASOC 2007)

Even if a proposal for a MPA is successful for it to be sustainable in the long term issues of policing and long-term funding will need to be addressed.

In conclusion, can the goal of a network of MPAs be met by 2012 Evidence would suggest that environmentally and scientifically the world is ready to accept MPAs in the Southern Ocean However, is the fragmented nature of the political and legal systems currently operating in the Antarctic arena is not able to efficiently regulate and implement MPA.

References

The Antarctic and Southern Ocean Coalition (ASOC), 2007. *Global Commons, Global Wilderness*, Global Heritage. Retrieved on January 13th 2008 from www.asoc.org

ASOC, 2007. *Landmark Agreement First of its Kind to Stop Destruction from High Seas Bottom Trawling* Retrieved on January 12th 2008 from www.asoc.org/pdfs/South%20Pacific

ASOC, 2007. *Protection of Seamounts*. Antarctic and Southern Ocean Coalition. Retrieved on 7th January 2008 from www.asoc.org.what_seamounts.htm

Brandao. A, Butterworth. D, Watkins. B and Millier. D, 2002. A first attempt at an assessment of the Patagonian Toothfish resource in the Prince Edward Islands EEZ. *CCAMLR Science*, Vol 9 pgs 11-32

Burgess.J, Waterhouse. E, Hemmings. A, Wilson. P, 2002. *Declaration of MPAs-The Case of the Balleny Islands Archipelago, Antarctica* in Breumer. J, Grant. A and Smith. D,(eds). Aquatic protected Areas: What works best and how do we know? Australian Society for Fish Biology. ISBN 0-646-43022-X

Convention of the Conservation for Antarctic Marine Living Resources (CCAMLR), 1982

CCAMLR Report, 2004. Protection of high seas: *The Antarctic and Southern Ocean Coalition. SC-CCAMLR XXIII-BG*. Retrieved on 11th January 2008 from www.asoc.org/Documents/XXIIICCAMLR/ASCOseamountsxxiiiccamlr.pdf

CCAMLR, 2005. Report of the CCAMLR workshop on MPAs. Retrieved on 10th January 2008 from www.ccamlr.org

Clark. M, and O'Driscoll, R. (2003). 'Deepwater Fisheries and Aspects of their Impact on Seamount Habitat in New Zealand'. *Journal of Northwest Atlantic Fisheries Science*, Vol 31: 441 – 458.

Clark. M, Rowden. A and Stocks. K, 2001. *CenSeam: a Global Census of Marine Life on Seamounts.* National Institute of Water and Atmospheric Science, Wellington

Duncan E.J. Currie, 2004. *Thailand, Protecting the Deep Seas Resolution of the Protection of Seamounts and other vulnerable sea habitats*. Retrieved on 9th January 2008 from www.savethehighseas.org/publicdocs/DCurrie_OceansForum.pdf

Grant S. M, 2005. Challenges of Marine Protected Area Development in Antarctica, *PARKS* Vol 15 No 3 High Seas Marine Protected Areas, p 40 – 47

IUCN (The World Conservation Union), 2006. MPAs: discussions and decisions in the CCAMLR context. 8th Meeting of the Conference of the Parties to the Convention on Biological Diversity. Brazil. Retrieved on 10th January 2008 from www.iucn.org

Kock. K, 1992. *Antarctic Fish and Fisheries*. Cambridge University Press, Great Britain

Marlow T.R., Agnew D.J., Purves M.G. (2003). Movement and Growth of Tagged *Dissostichus eleginoides* Around South Georgia and Shag Rocks (Subarea 48.3). *CCAMLR Science,* Vol 10**:** 101 – 111

Martin K,. Samoilys M., Hurd A., Lundin C, 2006. *Experiences in the use of MPAs with fisheries management objectives- A review of case studies.*

A report for the Food and Agriculture Organisation of the United Nations. Retrieved on January 10th 2008 from www.cbd.int

Njastad B, 1998. First Antarctic Protected Areas Workshop Report. Norsk Polarinstitutt, Tromo, Norway.

Nybakken. J and Bertness. M, 2005. *Marine Biology: an ecological approach. Pearson Education*, San Francisco

Rogers. A, (n.d), *EXPOSE: Exploration of polar seamounts.* Retrieved January 11th 2008, from http://classic.ipy.org/development/ideas/individual/idea194.pdf.

Schmidt S., and Christiansen S. (2004). *The Offshore MPA Toolbox: Seamounts – A Case Study.* Retrieved January 10th 2008, from http://www.ngo.grida.no/wwfneap/Projects/Reports/Offshore_Toolbox.pdf

67th Meeting of the Committee on Fisheries, Food and Agriculture Organization Deep Sea Fishing in Areas Beyond National Jurisdiction: Implementing the 2006 UN General Assembly Resolution on Sustainable Fisheries, March 5-9, 2007 Rome, Italy

Seamounts Online, 2007. *Distribution of seamounts.* http://seamounts.sdsc.edu/. Retrieved on 10th January 2008

Smith. P and McVeagh. M, 2000. Allozyme and microsatellite DNA markers of toothfish population structure in the Southern Ocean, *Journal of Fish Biology* 57 pgs 72-83

Smith, (n.d), *Seamount fisheries in New Zealand: Effects on high-value target fish species and non-target invertebrates*. Retrieved January 11th 2008, from

http://www.unep.org/bpsp/Fisheries/Fisheries%20Case%20Study%20Summaries/Smith(Summary).pdf

The Antarctic Treaty, 1959

The Protocol on Environmental Protection to the Antarctic Treaty, 1991

Triggs, G and Riddell A, 2007 (eds). *Antarctica: Legal and Environmental Challenges for the Future* (The British Institute of International and Comparative Law, London)

United Nations General Assembly Resolution 59/25 on Sustainable Fisheries, 10 November 2004 paragraph 66.

Valenci, J. (ed). 1999 Report of the Second Antarctic protected Areas Workshop. Instituto Antartico Chileno, Santiago. Retrieved on 10th January 2008 from www.cep.ats.aq

Vierros. M and Cheung. W, 2007. *Synthesis and review of the best available scientific studies on priority areas for biodiversity conservation in marine areas beyond the limits of national jurisdiction.* United Nations University Institute of Advanced Studies

Watson. R, Morato. T, 2004. Exploitation patterns in seamount fisheries: A preliminary analysis. In: Morato. T, Pauly. D (Eds.), Seamounts: Biodiversity and fisheries. *FCRR12* (5), pg 61-65

Williams. R, Tuck. G, Constable. A and Lamb. T, 2001. Movement, growth and available abundance to the fishery of *Dissostichus eleginoides* Smitt, 1989 at Herd Island, derived from tagging experiments. *CCAMLR Science*, Vol 9, pgs 33-48